Quality Assurance Project Plan
Lower Passaic River Restoration Project

River Mile 10.9 Characterization Addendum C
Data Gap Sample Collection to Support Sediment Removal Activities

June 2012, Rev. 1

Prepared for:

Cooperating Parties Group
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AECOM

Quality Assurance Project Plan

River Mile 10.9 Characterization Addendum C
Data Gap Sample Collection to Support Sediment Removal Activities
Lower Passaic River Restoration Project
New Jersey

Lower Passaic River Study Area

River Mile 10.9 Characterization Addendum C

Data Gap Sample Collection to Support Sediment Removal Activities

June 2012

Revision 1

Approved By: _____ Date: June 14, 2012
Roger McCready, Feasibility Study Manager/CH2M Hill

Approved By: _____ Date: _____
Debra L. Simmons, Project QA Manager/AECOM

Approved By: _____ Date: June 14, 2012
Laura Kelmar, Project Manager/AECOM

Introduction

This document is an addendum to the *River Mile 10.9 Characterization Quality Assurance Project Plan Lower Passaic River Restoration Project*, Revision 3, dated October 21, 2011 (RM 10.9 QAPP; AECOM, 2011a). This QAPP Addendum outlines additional tasks associated with the River Mile (RM) 10.9 characterization program including data gap sample collection to support sediment removal activities in the RM 10.9 Removal Area located in the Lower Passaic River Study Area (LPRSA). This QAPP Addendum includes details for collection of geotechnical data and associated Quality Assurance (QA) and Quality Control (QC) activities developed for this program.

Table 1 provides a key to the RM 10.9 QAPP and this Addendum and includes the following:

- Worksheets that are included by reference as written in the RM 10.9 QAPP (i.e., not revised for this addendum);
- Worksheets that are included by reference, but with exclusions (e.g., removal of specific analytes);
- Worksheets that are included by reference, but with additions (e.g., addition of sediment treatment vendors); and
- Worksheets that are revised and included in this addendum.

In addition to the QAPP worksheets, this addendum includes an introduction (this section) and additional field Standard Operating Procedures (SOPs) and laboratory SOPs as attachments; see appendices A and B, respectively.

Background Information

The LPRSA encompasses the 17.4-mile tidal reach of the Passaic River below the Dundee Dam, its tributaries, and the surrounding watershed that hydrologically drains below the Dundee Dam. Overall goals of the Remedial Investigation/Feasibility Study (RI/FS) and a description of the associated investigations have been presented in the Work Plan (MPI 2005a), three Field Sampling Plans (FSP1 [MPI 2006a], FSP2 [MPI 2006b], and FSP3 [MPI 2005b]), and a QAPP (MPI 2005c).

In April 2011, the Cooperating Parties Group (CPG) agreed to undertake additional sampling and data collection to characterize an approximately 8.9 acre deposit of sediments located near RM 10.9. The general scope of the characterization effort included sample collection (i.e., sediment cores) and analysis and a bathymetry survey. This work was performed in accordance with the RM 10.9 QAPP (AECOM, 2011a). In addition, a hydrodynamic study was performed in accordance with the *River Mile 10.9 Hydrodynamic Field Investigation Quality Assurance Project Plan for the Lower Passaic River, Lower Passaic River Restoration Project*, October 2011, Revision 2 (AECOM, 2011b).

As part of the RM 10.9 Administrative Order on Consent (RM 10.9 AOC; USEPA in prep), the CPG has agreed in addition to the removal and capping of approximately 16,000 cubic yards (cy) of sediments to collect bench-scale sediment samples that will be used to determine the efficacy and cost effectiveness of treating a portion of the RM 10.9 sediments using sediment decontamination technologies.

Sampling Objective

The objective of the sampling proposed in this RM 10.9 QAPP Addendum is to advance geotechnical borings and collect geotechnical information to support the sediment removal activities. The geotechnical borings will provide the engineering data needed to design piles for sediment resuspension control measures (e.g., silt curtain barrier system or sheet pile wall), which may be implemented during dredging activities.

Sampling and Analysis Approach

The field sampling activities and analytical program presented in this QAPP Addendum include the following elements:

Geotechnical Boring Stations: Four geotechnical boring stations were selected to support the sediment removal activities, see Figure 1. These stations are located on approximately 600 foot centers and were chosen based on a review of available site and regional geology maps, and information relevant to the geotechnical study for this area. Borings will be installed using sonic drilling to a maximum depth of approximately 40 feet below the sediment surface or 5 feet into bedrock, if encountered.

Geotechnical Boring Sampling Task:

Geotechnical boring samples will be collected using the Standard Penetration Test (SPT) split-barrel sampler for cohesionless soils and the Modified California or thin-walled tube sampler for cohesive soils. The borings will be advanced using a sonic drill rig and samples will be collected with the sonic drill rig, with an SPT sampler and with a thin-walled tube sampler. Sampling will be conducted in advance of the sonic drill casing. Two borings will be advanced at each station: one boring for advancing the SPT sampler and one boring for advancing the thin-walled tube sampler.

The borings will be advanced with a sonic drill rig using Lexan core liners to provide a continuous sample of the sediments encountered. During advancement of the boring the Relative Drilling Resistance shall be estimated (see SOP LPR-S-05). Upon retrieval, the Lexan core liner will be extracted from the core barrel. Sheer strengths will be estimated in the field at five foot intervals or change in lithology by cutting a small hole in the Lexan core liner and by using a pocket penetrometer (See SOP LPR-S-05). Samples for geotechnical analyses (see below) will be collected from the sediment collected from the sonic drilling. A minimum of one sample per 10 feet will be submitted for analysis. The sampling frequency may be adjusted if changes in the lithology indicate more frequent samples are required.

The boring for SPT sampling will be advanced first. An SPT sample will be collected every five feet at the first boring. If consistent lithology is observed at this first boring to the boring completion depth, the sampling frequency may be reduced to one sample every 10 feet. SPT blow counts will be recorded by driving the 2.0-inch diameter (OD) SPT sampler using a 140-pound hammer falling 30-inches or an ASTM calibrated auto sampler for a penetration of 18 inches or refusal, in accordance with ASTM D1586 *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils* (see SOP LPR-S-05.)

A separate boring will be advanced to collect undisturbed samples. These samples will be collected from zone of softest sediments as estimated by the sediments with the lowest SPT blow counts. Undisturbed samples will be collected with a thin-walled sampler (e.g., a Shelby Tube) and will be sealed and packed on the vessel for shipment to geotechnical laboratory. Prior to sealing these samples, the sheer strengths will

be estimated in the field of the exposed sediment at the top and bottom of the thin-walled sampler using a pocket penetrometer (See SOP LPR-S-05). The samples will be submitted for geotechnical analyses (see below). A minimum of one sample per station will be submitted for geotechnical analyses. Additional sample intervals may be selected after review of the SPT blow counts and sediment lithology.

The drilling and sampling will be conducted under the direct supervision of a geologist or geotechnical engineer. He/she will log the borings, record blow-counts from SPT tests, visually classify the sediments, and determine samples for laboratory tests (See SOP LPR-S-05).

Geotechnical Boring Sample Processing: Geotechnical boring samples will be collected and placed directly into the appropriate sample containers on the vessel or alternatively at the field facility according to the analyses requested. Sampling of all stations is expected to be completed over a one-week period.

Geotechnical Boring Sample Analysis: The samples collected by sonic drilling will be submitted for analysis of moisture content, specific gravity, Atterberg limits for cohesive soils, and grain size. The undisturbed samples will be submitted for analysis of moisture content, specific gravity, Atterberg limits for cohesive soils, grain size, and unconfined compressive strength for cohesive soils. The RM 10.9 QAPP Addendum C physical parameters will be analyzed using the same methods and by the same laboratory as specified in the RM 10.9 QAPP (refer to RM 10.9 QAPP Worksheets #19, 23, and 30). Parameters not included in the RM 10.9 QAPP are discussed in RM 10.9 Addendum C Worksheets #19, 23, and 30.

Figure 1: Proposed Geotechnical Boring Locations

Table 1. QAPP Worksheet Key

Worksheet No.	Worksheet Title	RM 10.9 QAPP Worksheets			RM 10.9 QAPP Addendum Worksheet
		No Changes	Changes - Additions	Changes - Exclusions	
1	Title and Approval Page				Replacement
2	QAPP Identifying Information		Updated to reflect Addendum C scoping session and to add RM 10.9 QAPP Addenda A and B to list of documents		Replacement
3	Distribution List		Added AECOM Task Manager, CH2M HILL Feasibility Study Manager, drilling and vessel subcontractors		Changes only
4	Project Personnel Sign-Off Sheet		Added AECOM Task Manager, CH2M HILL Feasibility Study Manager, drilling and vessel subcontractors		Changes only
5	Project Organizational Chart				Replacement
6	Communication Pathways				Replacement
7	Personnel Responsibilities and Qualifications Table		Added AECOM Task Manager and CH2M HILL Feasibility Study Manager		Replacement
8	Special Personnel Training Requirements Table	X			see RM 10.9 QAPP Worksheet
9	Project Scoping Session Participants Sheet		Added Addendum C Scoping Session		Changes Only
10	Problem Definition				Replacement
11	Project Quality Objectives/Systematic Planning Process Statements				Replacement
12	Measurement Performance Criteria Table		Added new geotechnical parameters	Addendum target analytes only	Changes Only
13	Secondary Data Criteria and Limitations Table	X			see RM 10.9 QAPP Worksheet
14	Summary of Project Tasks				Replacement

Table 1. QAPP Worksheet Key

15	Reference Limits and Evaluation Table		Added new geotechnical parameters	Addendum target analytes only	Changes Only
16	Project Schedule/Timeline Table				Replacement
17	Sampling Design and Rationale				Replacement
18	Sampling Locations and Methods/SOP Requirements Table				Replacement
19	Analytical SOP Requirements Table		Added new geotechnical parameters	Addendum target analytes only	Changes Only
20	Field Quality Control Sample Summary Table				Replacement
21	Project Sampling SOP Reference Table		Added SOP for geotechnical borings and removed reference to SOPs not relevant to Addendum C.		Changes only
22	Field Equipment			Bathymetry equipment not applicable	see RM 10.9 QAPP Worksheet
23	Analytical SOP Reference Table		Added new geotechnical parameters	Addendum target analytes only	Changes Only
24	Analytical Instrument Calibration Table		Added new geotechnical parameters	Addendum target analytes only	see RM 10.9 QAPP Worksheet
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table		Added new geotechnical parameters	Addendum target analytes only	see RM 10.9 QAPP Worksheet
26	Sample Handling System	X			see RM 10.9 QAPP Worksheet
27	Sample Custody Requirements		Added sample nomenclature for geotechnical samples		Changes only
28	QC Samples Table		Added new geotechnical parameters	Addendum target analytes only	Changes Only

Table 1. QAPP Worksheet Key

29	Project Documents and Records Table	X			see RM 10.9 QAPP Worksheet
30	Analytical Services Table		Added new geotechnical parameters	Addendum target analytes only	Changes Only
31	Planned Project Assessment Table			Safety and technical audits and PE samples not applicable	see RM 10.9 QAPP Worksheet
32	Assessment Findings and Response Actions			Safety and technical audits and PE samples not applicable	see RM 10.9 QAPP Worksheet
33	QA Management Reports Table			Data validation reports not applicable; validation of geotechnical parameters will not be conducted	see RM 10.9 QAPP Worksheet
34	Sampling and Analysis Verification (Step I) Process Table	X			see RM 10.9 QAPP Worksheet
35	Sampling and Analysis Validation (Steps IIa and IIb) Process Table			Steps IIb not applicable; validation of geotechnical parameters will not be conducted	see RM 10.9 QAPP Worksheet
36	Sampling and Analysis Validation (Steps IIa and IIb) Summary Table			Validation of geotechnical parameters will not be conducted	see RM 10.9 QAPP Worksheet
37	Data Usability Assessment				Replacement

QAPP Worksheet #1 (UFP-QAPP Manual Section 2.1) Title and Approval Page

Document Title: Lower Passaic River Study Area, River Mile 10.9 Characterization Addendum C – Data Gap Sample Collection to Support Sediment Removal Activities.

Lead Organization: Cooperating Parties Group and de maximis, inc.

Preparer's Name and Organizational Affiliation: Douglas E. Simmons, AECOM

Preparer's Address and Telephone Number:

250 Apollo Dr., Chelmsford, MA 01824
978-905-2401

Preparation Date (Day/Month/Year): Addendum C – Data Gap Sample Collection to Support Sediment Removal, Revision 0, May 2012; Revision 1, June 2012

Investigative Organization's Project Manager

Roger McCready/CH2M HILL / Laura Kelmar /AECOM / June2012

Investigative Organization's Project Quality Assurance (QA) Manager

Debra Simmons / AECOM / June 2012

Lead Organization's Project Manager

Bill Potter / Robert Law / de maximis, inc. / June 2012

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

Site Name/Project Name: **Diamond Alkali Operable Unit (OU 2) – LPRRP RI/FS**

Site Location: **Lower Passaic River Study Area (LPRSA), New Jersey**
Site Number/Code : **CERCLA Document No. 02-2007-2009**
Operable Unit: **OU 2**
Contractor Name: **AECOM**
Contractor Number: **Not Applicable (N/A)**
Contract Title: **N/A**
Work Assignment Number: **N/A**

1. Identify guidance used to prepare QAPP:

   Uniform Federal Policy for Quality Assurance Project Plans. Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs. Part 1: UFP-QAPP Manual. Final Version 1. March 2005. Intergovernmental Data Quality Task Force (US Environmental Protection Agency, US Department of Defense, US Department of Energy). USEPA 505-B-04-900A.

2. Identify regulatory program: Comprehensive Environmental Response Compensation, and Liability Act (CERCLA)

3. Identify approval entity: USEPA Region 2

4. Indicate whether the QAPP is a generic or a project-specific QAPP. (circle one)

5. List dates of scoping sessions that were held: May 12 and 19 and June 8, 2011 (RM 10.9 QAPP); and May 3, 2012 (RM 10.9 QAPP Addendum C)

6. List dates and titles of QAPP and FSP documents written for previous site work, if applicable:

Title
CLH 1995. *Work Plan, Vol. 1 of Passaic River Study Area Remedial Investigation Work Plans*. Chemical Land Holdings (now Tierra Solutions, Inc.), Newark, NJ. January 1995.
Tierra Solutions, Inc. 1999. *Passaic River Study Area Ecological Sampling Plan. Quality Assurance Project Plan*. March 1999.
MPI 2005. *Lower Passaic River Restoration Project. Quality Assurance Project Plan.* Prepared for US Environmental Protection Agency and US Army Corps of Engineers. Malcolm Pirnie, Inc., White Plains, NY.
MPI 2006. *Lower Passaic River Restoration Project. Field Sampling Plan*. Volume 1. Prepared for US Environmental Protection Agency, US Army Corps of Engineers. Malcolm Pirnie, Inc., White Plains, NY.
MPI 2007c. *QAPP/FSP Addendum for Lower Passaic River Restoration Project Empirical Mass Balance Evaluation*. December 2007.
ENSR 2008. *Lower Passaic River Restoration Project RI/FS. Quality Assurance Project Plan. RI Low Resolution Coring/Sediment Sampling*. Revision 4. ENSR, Westford, MA. October 2008.
AECOM 2010. *Lower Passaic River Restoration Project: Periodic Bathymetric Surveys. Quality Assurance Project Plan*. Revision 2. AECOM, Westford, MA. May 2010.

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

Windward 2009a. *Lower Passaic River Restoration Project. Lower Passaic River Study Area RI/FS. Quality Assurance Project Plan: Fish and Decapod Crustacean Tissue Collection for Chemical Analysis and Fish Community Survey*. Final. Prepared for Cooperating Parties Group, Newark, New Jersey. Windward Environmental LLC, Seattle, WA. August 2009.
Windward 2009b. *Lower Passaic River Restoration Project. Lower Passaic River Study Area RI/FS. Quality Assurance Project Plan: Surface Sediment Chemical Analyses and Benthic Invertebrate Toxicity and Bioaccumulation Testing*. Final. Prepared for Cooperating Parties Group, Newark, New Jersey. October 8, 2009. Windward Environmental LLC, Seattle, WA. October 2009.
AECOM 2010. *Quality Assurance Project Plan/Field Sampling Plan Addendum. Remedial Investigation Water Column Monitoring/Physical Data Collection for the Lower Passaic River, Newark Bay and Wet Weather Monitoring. Lower Passaic River Restoration Project.* Revision 4. AECOM, Westford, MA. March 2010.
Tierra Solutions, Inc. 2010. *Combined Sewer Overflow/Stormwater Outfall Investigation Quality Assurance Project Plan. Lower Passaic River Study Area*. Revision 0. July 2010.
AECOM 2011a. *Lower Passaic River Study Area River Mile 10.9 Characterization Quality Assurance Project Plan*. Revision 3. Prepared for Cooperating Parties Group, Newark, New Jersey. AECOM, Chelmsford, MA. October 2011.
AECOM 2012a. *Lower Passaic River Study Area River Mile 10.9 Characterization Quality Assurance Project Plan Addendum A. Sediment Collection for Bench-Scale Testing of Sediment Treatment and Dewatering Technologies and for Additional Delineation*. Prepared for Cooperating Parties Group, Newark, New Jersey. AECOM, Chelmsford, MA. May 2012.
AECOM 2012b. *Lower Passaic River Study Area River Mile 10.9 Characterization Quality Assurance Project Plan Addendum B. Bench-Scale Testing of Sediment Treatment Technologies*. Prepared for Cooperating Parties Group, Newark, New Jersey. AECOM, Chelmsford, MA. (in progress).

7. List organizational partners (stakeholders) and connection with lead organization:

   This work will be performed under the requirements of the Settlement Agreement and SOW with oversight conducted by USEPA and its government partners; de maximis, inc. (acting as Project Coordinator for the CPG), AECOM, CH2M HILL, and its subcontractors, are conducting the work on behalf of the CPG.

8. List data users: See item #7 above.

9. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table.
   Provide an explanation for their exclusion below: N/A ____

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to QAPP Worksheet No. or Related Documents
Project Management and Objectives		

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

2.1 Title and Approval Page	- Title and Approval Page	1
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	2
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	3 4
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications Table - Special Personnel Training Requirements Table	5 6 7 8
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Planning Session Documentation (including Data Needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps	9 9 10 and Introduction Figure 1
2.6 Project Quality Objectives (PQOs) and Measurement Performance Criteria 2.6.1 Development of PQOs Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria Table	11 12
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	13
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Reference Limits and Evaluation Table - Project Schedule/Timeline Table	14 15 16
Measurement/Data Acquisition		

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.2 Sample Containers, Volume, and Preservation 3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures 3.1.2.4 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures 3.1.2.5 Supply Inspection and Acceptance Procedures 3.1.2.6 Field Documentation Procedures	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/ SOP Requirements Table - Analytical Methods/SOP Requirements Table - Field QC Sample Summary Table - Sampling SOPs - Project Sampling SOP References Table - Field Equipment Calibration, Maintenance, Testing, and Inspection Table	17 Figure 1 18 19 20 Appendix B 21 22
3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures	- Analytical SOPs - Analytical SOP References Table - Analytical Instrument Calibration Table - Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	Appendix C 23 24 25
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	- Sample Collection Documentation - Handling, Tracking, and Custody SOPs - Sample Container Identification - Sample Handling Flow - Example Chain-of-Custody Form and Seal	26 Appendix B 27 27 Appendix B
3.4 QC Samples 3.4.1 Sampling QC Samples 3.4.2 Analytical QC Samples	- QC Samples Table	28
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	- Project Documents and Records Table - Analytical Services Table - Data Management Procedures	29 30 Data Management Plan (DMP) (AECOM 2010c)
Assessment/Oversight		

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

4.1 Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	- Planned Project Assessments Table - Assessment Findings and Corrective Action Responses Table	31 32
4.2 QA Management Reports	- QA Management Reports Table	33
4.3 Final Project Report	To be completed following data collection	Not Available (NA)
Data Review		
5.1 Overview 5.2 Data Review Steps 5.2.1 Step I: Verification 5.2.2 Step II: Validation 5.2.2.1 Step IIa Validation Activities 5.2.2.2 Step IIb Validation Activities 5.2.3 Step III: Usability Assessment 5.2.3.1 Data Limitations and Actions from Usability Assessment 5.2.3.2 Activities	- Verification (Step I) Process Table - Validation (Steps IIa and IIb) Process Table - Validation (Steps IIa and IIb) Summary Table - Usability Assessment	34 35 36 37
5.3 Streamlining Data Review 5.3.1 Data Review Steps To Be Streamlined 5.3.2 Criteria for Streamlining Data Review 5.3.3 Amounts and Types of Data Appropriate for Streamlining	To be completed following data evaluation	NA

QAPP Worksheet #3 (UFP-QAPP Manual Section 2.3.1) Distribution List

The following persons will receive a copy of the approved Final QAPP, subsequent QAPP revisions, addenda, and amendments:

QAPP Recipients	Title	Organization	Telephone Number	E-mail Address	Document Control Number*
Doug Simmons	RM 10.9 Characterization Addendum C Task Manager	AECOM	978.905.2401	Doug.Simmons@aecom.com	
Roger McCready	RM 10.9 Feasibility Study Manager	CH2M HILL	937.220.2961	Roger.McCready@ch2m.com	
Fred Lavoie	Drilling Subcontractor	Boart Longyear	508.936.1027	FLavoie-1@boartlongyear.com	
Sven van Batavia	Vessel Subcontractor	Miller Marine, Inc.	718.727.7303	Sven@millerslaunch.com	

*Uncontrolled electronic copies will be available on www.ourpassaic.org

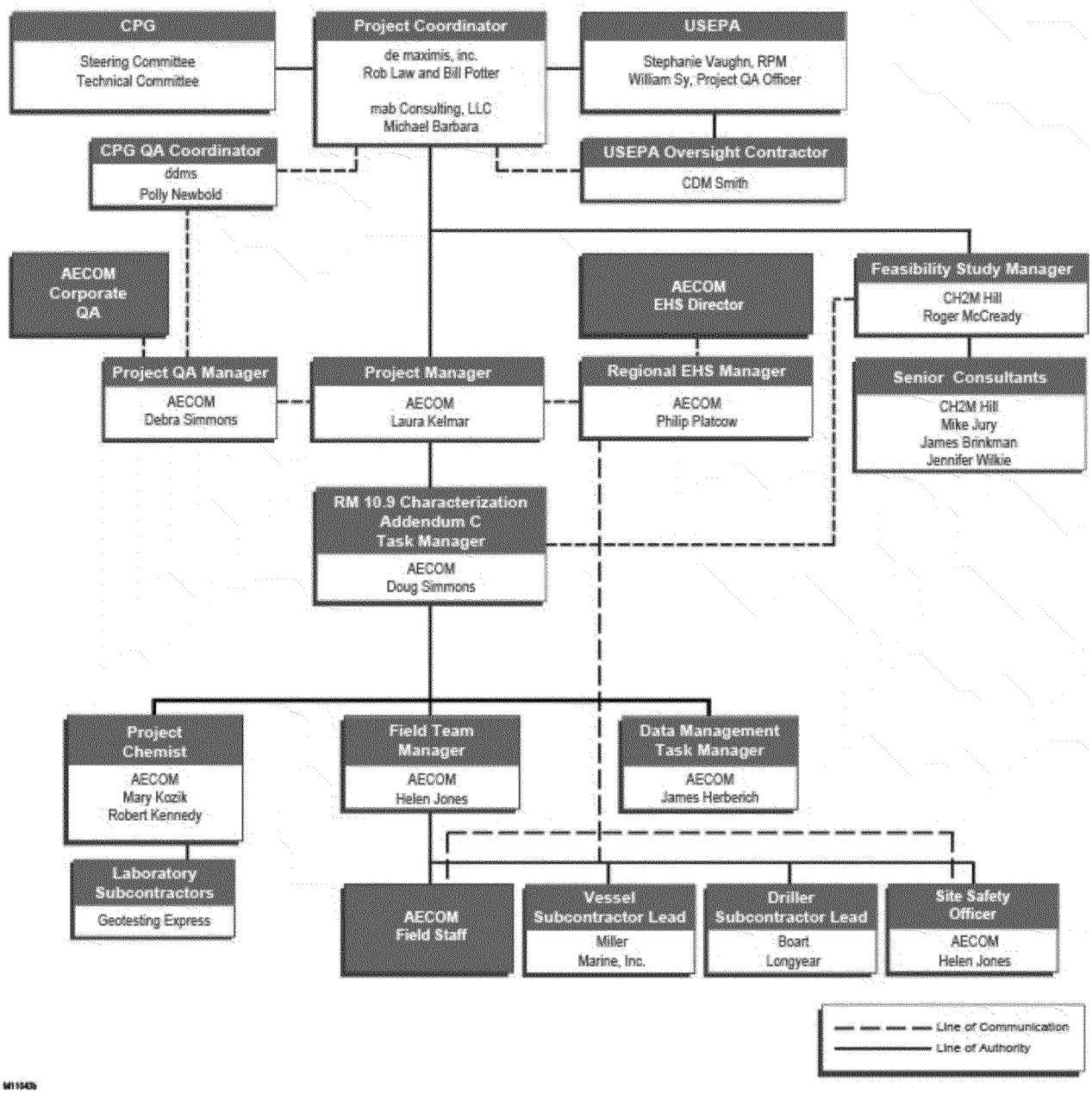
QAPP Worksheet #4 (UFP-QAPP Manual Section 2.3.2) Project Personnel Sign-Off Sheet

Organization: A completed sign-off sheet will be maintained in the files for each organization represented below.

QAPP Recipients	Title	Organization	Telephone Number	E-mail Address	Document Control Number*
Doug Simmons	RM 10.9 Characterization Addendum C Task Manager	AECOM	978.905.2401	Doug.Simmons@aecom.com	
Roger McCready	RM 10.9 Feasibility Study Manager	CH2M HILL	937.220.2961	Roger.McCready@ch2m.com	
Fred Lavoie	Drilling Subcontractor	Boart Longyear	508.936.1027	FLavoie-1@boartlongyear.com	
Sven van Batavia	Vessel Subcontractor	Miller Marine, Inc.	718.727.7303	Sven@millerslaunch.com	

*Signature indicates that personnel have read the applicable QAPP sections and will perform the tasks as described.

QAPP Worksheet #5 (UFP-QAPP Manual Section 2.4.1) Project Organizational Chart



QAPP Worksheet #6 (UFP-QAPP Manual Section 2.4.2) Communication Pathway

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (timing, pathways, etc.)
Field activities status and issues	AECOM FTM	Helen Jones	Cell 607.342.7302	Communicate daily, or as needed, with AECOM field personnel, subcontractors, and AECOM Task Manager directly, or via e-mail or phone. Minor work plan deviations and/or proposed revisions will be documented and communicated in writing, with a copy sent to USEPA.
Sampling progress/laboratory coordination	AECOM Task Manager	Doug Simmons	978.905.2401 Cell 978.273.4649	Communicate daily, or as needed, with AECOM FTM and Project Chemist via e-mail or phone.
Health and safety briefings and updates	AECOM SSO	Helen Jones	Cell 607.342.73028	Communicate daily, or as needed, with field personnel and subcontractors directly, or via e-mail or phone.
Significant health and safety concerns or incidents	AECOM SSO	Helen Jones	Cell 607.342.7302	Communicate immediately with AECOM Regional EHS Manager, AECOM Task Manager, and AECOM PM.
Sampling vessel operations	Sampling Vessel Captain	Captain Brandon Mastropietro	Cell 845-418-9465	Communicate daily, or as needed, with AECOM FTM directly. The sampling vessel captain has the ultimate authority for stopping work while working on water. The vessel captain, in consultation with the SSO, will follow guidelines documented in the site-specific Health and Safety Plan (HASP). In addition, standard safe boating practices related to weather conditions and vessel operations will apply, even if not specifically addressed in the HASP.

QAPP Worksheet #6 (UFP-QAPP Manual Section 2.4.2) Communication Pathway

Drilling Operations	Drilling Subcontractor Lead	John Graglia	Cell: 781.953.8684	Communicate daily, or as needed, with AECOM FTM directly. The drilling subcontractor lead has the authority for stopping work while conducting drilling operations. The drilling subcontractor lead, in consultation with the SSO, will follow guidelines documented in the site-specific HASP.
Analytical laboratory issues, including coordination with field, schedule, and technical issues	AECOM Project Chemist	Mary Kozik	978.905.2277	Communicate with AECOM FTM and Laboratory PM as needed via phone or e-mail.
Nonconformances (field and/or laboratory)	AECOM Project QA Manager	Debra Simmons	978.905.2399	Communicate findings to AECOM Task Manager or Laboratory PM (as appropriate); including corrective actions (CA), to AECOM PM, AECOM Task Manager, and CPG QA Coordinator.
Issues potentially affecting DQOs	AECOM FTM	Helen Jones	Cell 607.342.7302	Communicate as needed with AECOM QA Manager and AECOM Task Manager via e-mail or phone. Notification of the CPG QA Coordinator as appropriate.
	Vessel Subcontractor Lead	Captain Brandon Mastropietro	Cell 845-418-9465	
	Drilling Subcontractor Lead	John Graglia	Cell: 781.953.8684	
	AECOM Project Chemist	Mary Kozik	978.905.2277	
	AECOM Task Manager	Doug Simmons	978.905.2401 Cell 978.273.4649	Communicate with AECOM QA Manager and AECOM PM as needed, via e-mail or phone. Notification of the CPG QA Coordinator as appropriate. Significant work plan modifications will be reported to USEPA in writing prior to implementation.

QAPP Worksheet #6 (UFP-QAPP Manual Section 2.4.2) Communication Pathway

Sediment sample collection task implementation, including sampling, analysis, and field reporting	AECOM FTM	Kris van Naerssen	Cell 607.342.73029	Communicate with AECOM Task Manager as needed, via email or phone.
Project status and issues	CH2M Hill	Roger McCready	937.220.2961	Communicate with CPG Project Coordinator and AECOM Task Manager daily, or as needed, via email or phone, and submit monthly progress reports.
Project status and issues (internal)	AECOM PM	Laura Kelmar	978.905.2266	Communicate with CPG Project Coordinator daily, or as needed, via email or phone, and submit monthly progress reports.
Project status and issues (external)	CPG Project Coordinator	Bill Potter/ Robert Law (de maximis, inc.) Mike Barbara (mab.Consulting, LLC)	908.735.9315	Communicate with USEPA RPM as needed via e-mail or phone.
	CPG Coordinating Counsel	William Hyatt / Dawn Monsen (K&L Gates)	973.848.4045 or 4148	In the event the CPG Project Coordinator is unavailable for communication with USEPA, the AECOM PM will notify the Coordinating Counsel prior to contacting USEPA.
Quality status and issues	CPG QA Coordinator	Polly Newbold	908.479.1975	Communicate with CPG Project Coordinator as needed via email or telephone
Data management	AECOM FTM	Kris van Naerssen	Cell 978.844.4591	Communicate with the Data Management Task Manager via email; transmit final field locations and sample collection information daily.
	AECOM Data Management Task Manager	Jim Herberich	978.905.2243	Maintain comprehensive project technical database, communicate with AECOM FTM to receive data from the field; communicate with Laboratory PM(s) to receive analytical result data; communicate with AECOM Task Manager to provide data for review; and provide data deliverables to USEPA.

QAPP Worksheet #6 (UFP-QAPP Manual Section 2.4.2) Communication Pathway

	Laboratory PM	See Worksheet #30	See Worksheet #30	Transmit Electronic Data Deliverables (EDDs) to Data Management Task Manager.
Stop Work (technical non-compliance)	AECOM Field team, Subcontractors, Project QA Manager, Project Chemists, and Data Management Task Manager			Any personnel believing that a work stoppage is necessary shall first verbally notify the AECOM Task Manager or the AECOM PM, who will in turn verbally notify de maximis, inc. and/or AECOM Project QA Manager, if necessary. Given the potential significance of such communications, this will occur as quickly as possible.

QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Robert Law	CPG Project Coordinator (Lead)	de maximis, inc.	Overall responsibility for the safe and proper execution of task. Be available to discuss and review technical and other issues that may arise during work. Periodically review and audit work to ensure that work plan, project quality assurance/quality control (QA/QC), and Health and Safety including both boating and hazardous materials worker safety procedures are being followed. All deviations from approved project plans will be discussed with and approved by the CPG Project Coordinator. Primary point of contact with the USEPA, its oversight contractor and the LPRSA Partner Agencies.	PhD, Geology, 26 years experience
Willard Potter	CPG Project Coordinator (Alternate)	de maximis, inc.	Serves as back up for the Lead CPG Project Coordinator. Responsible for the safe and proper execution of task. Be available to discuss and review technical and other issues that may arise during work. Periodically review and audit work to ensure that work plan, project QA/QC, and Health and Safety including both boating and hazardous materials worker safety procedures are being followed. All deviations from approved project plans will be discussed with and approved by the CPG Project Coordinator. Primary point of contact with the USEPA, its oversight contractor and the LPRSA Partner Agencies.	BS, Chemical Engineering, 36 years experience
Roger McCready	RM 10.9 Feasibility Study Manager	CH2M Hill	Overall responsibility for technical oversight of RI tasks. Primary point of contact for CH2MHill with CPG Project Coordinator.	MS, Geology, 24 years experience

QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table

Mike Barbara, PE	Principal	mab.consulting LLC	Project oversight and coordination with the CPG Coordinator.	ME, Environmental Engineering, BE, Civil Engineering, 37 years experience
Laura Kelmar	AECOM PM	AECOM	Overall responsibility for completion of RI tasks in accordance with SOW requirements including technical, financial, and scheduling. Primary point of contact for AECOM with CPG Project Coordinator.	BS, Chemical Engineering, MS, Environmental Engineering, 20 years experience
Doug Simmons	AECOM Task Manager	AECOM	Responsible for the execution and completion of the RM 10.9 Characterization program, including procurement of subcontractors, review of task deliverables, and serving as the focus for coordination of all field and laboratory tasks. The AECOM Task Manager will keep the AECOM PM apprised of the status of the task; as well communicate any issues with the schedule, budget, or achievement of the task objectives.	MS, Geology, 37 years experience
Helen Jones	FTM	AECOM	Responsible for implementing field sampling activities in accordance with the approved plans QAPP, HASP) and pertinent SOPs. Primary responsibilities will include directing activities on site, monitoring subcontractor performance in the field, reviewing field records, and communicating daily with the AECOM Task Manager regarding status, quality issues, or delays.	BS, Chemistry & Mathematics, MS, Geochemistry, 6.5 years experience

QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table

Debra Simmons	Project QA Manager	AECOM	Responsible for reviewing and approving QA procedures, ensuring that planned QA assessments (e.g., technical surveillance audits [TSA], data validation) are conducted according to the QAPP and the AECOM Quality Management Plan (QMP), (AECOM 2009) and reporting on the adequacy of the QA Program to the AECOM PM.	BS, Biology, 28 years experience
Philip Platcow	Regional EHS Manager	AECOM	Responsible for ensuring that the objectives of AECOM's Health and Safety Program are met and for monitoring task activities for conformance to the HASP.	MS, Industrial Hygiene, 25 years experience
Helen Jones	SSO	AECOM	Responsible for monitoring subcontractor/field team performance in the field and communicating daily with the AECOM FTM, AECOM Task Manager or Regional EHS Manager, as appropriate, regarding health and safety, etc. Will ensure that the objectives of the project's Health and Safety Program are met.	BS, Chemistry & Mathematics, MS, Geochemistry, 6.5 years experience
Mary Kozik	Project Chemist (Lead)	AECOM	Responsible for laboratory procurement and monitoring of progress and will be the primary point of contact with the laboratory(ies). The Project Chemist will also be responsible for communicating any issues that could affect achievement of the DQOs to the AECOM RM 10.9 Characterization Task Manager and the AECOM Project QA Manager.	MS, Chemistry, 32 years experience
Robert Kennedy	Project Chemist (Alternate)	AECOM	Responsible for providing additional technical resources and serves as a back up to the Lead Project Chemist.	BA, Chemistry, 27 years experience

QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table

Lisa Krowitz	Data Validation Coordinator	AECOM	Responsible for managing the validation task, including ensuring that validation is conducted and documented according to the requirements of this QAPP, and interacting with the laboratories to resolve any issues.	MS, Environmental Science, 24 years experience
James Herberich	Data Management Task Manager	AECOM	Responsible for data management for project, Including overall responsibility for database quality and structure, including graphical representation of data.	BA, Engineering Sciences, 22 years experience
Polly Newbold	CPG QA Coordinator	ddms, inc.	Provides oversight of project QA/QC. Periodically review and audit operations to ensure that QAPP/FSP Addendum QA/QC procedures are being followed.	BS, Textile Science, 26 years experience
Gary Torosian	Laboratory PM	GeoTesting Express	Acts as the primary point of contact at GeoTesting Express for the AECOM Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues.	BS, Civil Engineering, 20 years experience

QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table

QAPP Worksheet #9 (UFP-QAPP Manual Section 2.5.1) Project Scoping Session Participants Sheet

Project Name: RI River Mile 10.9 Characterization Addendum C - Data Gap Sample Collection to Support Sediment Removal Activities **Projected Date(s) of Sampling: May 2012** **Project Manager: Bill Potter/ Robert Law**	**Site Name: Diamond Alkali OU 2 - LPRRP RI/FS** **Site Location: LPRSA; RM 10.9**
Date of Session: 03 May 2012 **Scoping Session Purpose: Discussion among CH2M Hill staff concerning scope of data gap sample collection to support sediment removal activities.**	

Name	Affiliation	Phone #	E-mail Address	Project Role
Roger McCready	CH2M Hill	937.220.2961	Roger.McCready@ch2m.com	CPG Technical Consultant
Mike Jury	CH2M Hill	414. 847.0363	Mike.Jury@ch2m.com	CPG Technical Consultant
Jim Brinkman	CH2M Hill	617.523.2002	James.Brinkman@ch2m.com	CPG Technical Consultant
Jennifer Wilkie	CH2M Hill	773.458.2830	Jennifer.Wilkie@ch2m.com	CPG Technical Consultant

Comments/Decisions: Discussed data needs for the sediment removal activities. Preliminary locations for geotechnical borings were selected and analytical testing methods were evaluated and chosen.

QAPP Worksheet #10 (UFP-QAPP Manual Section 2.5.2) Problem Definition

The problem to be addressed by the RM 10.9 QAPP Addendum C:

Geotechnical data are needed within the RM 10.9 Removal Area to support the design of piles for sediment resuspension control measures (e.g., silt curtain barrier system or sheet pile wall), which may be implemented during dredging activities.

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

DQO Step	**RM 10.9 QAPP Addendum C Data Quality Objective: Advance geotechnical borings and collect geotechnical information to support sediment removal activities.** **Description**
STEP 1 **State the problem**	Geotechnical data are needed within the RM 10.9 Removal Area to support the design of piles for sediment resuspension control measures (e.g., silt curtain barrier system or sheet pile wall), which may be implemented during dredging activities.
STEP 2 **Identify the goals of the study**	**Principal Study Question** 1. What are the values of the physical / engineering parameters needed to design piles for sediment resuspension control measures? **Program Goals** This program will supplement the existing data previously collected in the immediate vicinity of RM 10.9 Removal Area. Analyses will include the following: • Moisture content • Specific gravity • Atterberg limits for cohesive soils • Grain size • Unconfined compressive strength for cohesive soils (undisturbed samples only) **Alternative Actions** The following alternative actions could result from resolution of the principal study questions: 1. Design of piles for a silt curtain barrier system. 2. Design of a sheet pile wall system. **Decision Statements on advancement of Geotechnical Borings and collection of geotechnical information to Support the Sediment Removal Activities**

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	The proposed geotechnical borings will provide the data necessary to support pile design. 2. Additional borings or analyses may be needed.
STEP 3 **Identify the information inputs**	Information required to answer the decision statement will include the existing field data and data to be obtained from the planned sampling events (See Step 5 of RM 10.9 Addendum C DQO), as summarized below. **New Data Needed** Geotechnical borings will be collected to a maximum depth of approximately 40 feet below the sediment surface or 5 feet into bedrock, if encountered. Samples from each station will be collected and submitted for analysis of parameters listed in Step 2 of RM 10.9 Addendum C DQO. **Existing Data** 1. AECOM, 2011. Draft Low Resolution Coring Characterization Summary. Lower Passaic River Study Area RI/FS. 2. CH2MHill and AECOM, April 2012. Draft River Mile 10.9 Characterization Program Summary, Lower Passaic River Study Area. **Existing Reports** 1. AECOM, 2011. Draft Low Resolution Coring Characterization Summary. Lower Passaic River Study Area RI/FS. 2. CH2MHill and AECOM, April 2012. Draft River Mile 10.9 Characterization Program Summary, Lower Passaic River Study Area.
STEP 4 **Define the boundaries of the study**	**Geographic Area** The RM 10.9 Removal Area is located within the RM 10.9 sediment deposit from approximately RM 10.8 to RM 11.1 and includes the mudflat and point bar in the east half of the river channel (Figure 1). **Timeframe** Samples will be collected over an estimated one-week period. **Sample Type** Sampling will include sediments from the four proposed geotechnical borings presented in Figure 1.

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

STEP 5 **Develop the analytical approach**	**Approach for Collecting Geotechnical Boring Samples** Geotechnical boring samples will be collected using the sonic drill rig, the SPT split-barrel sampler for cohesionless soils and the Modified California or thin-walled tube sampler for cohesive soils. The borings will be advanced using a sonic drill rig and samples will be collected with the sonic drill rig, with an SPT sampler and with a thin-walled tube sampler. Sampling will be conducted in advance of the sonic drill casing. Two borings will be advanced at each station: one boring for advancing the SPT sampler and one boring for advancing the thin-walled tube sampler. The borings will be advanced with a sonic drill rig using Lexan core liners to provide a continuous sample of the sediments encountered. During advancement of the boring the Relative Drilling Resistance shall be estimated (see SOP LPR-S-05). Upon retrieval, the Lexan core liner will be extracted from the core barrel. Sheer strengths will be estimated in the field at five foot intervals or change in lithology by cutting a small hole in the Lexan core liner and by using a pocket penetrometer (See SOP LPR-S-05). Samples for geotechnical analyses (see below) will be collected from the sediment collected from the sonic drilling. A minimum of one sample per 10 feet will be submitted for analysis. The sampling frequency may be adjusted if changes in the lithology indicate more frequent samples are required. The boring for SPT sampling will be advanced first. An SPT sample will be collected every five feet at the first boring. If consistent lithology is observed at this first boring to the boring completion depth, the sampling frequency may be reduced to one sample every 10 feet. SPT blow counts will be recorded by driving the 2.0-inch diameter (OD) SPT sampler using a 140-pound hammer falling 30-inches or an ASTM calibrated auto sampler for a penetration of 18 inches or refusal, in accordance with ASTM D1586 *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils* (see SOP LPR-S-05.) A separate boring will be advanced to collect undisturbed samples. These samples will be collected from zone of softest sediments as estimated by the sediments with the lowest SPT blow counts. Undisturbed samples will be collected with a thin-walled sampler (e.g., a Shelby Tube) and will be sealed and packed on the vessel for shipment to geotechnical laboratory. Prior to sealing these samples, the sheer strengths will be estimated in the field of the exposed sediment at the top and bottom of the thin-walled sampler using a pocket penetrometer (See SOP LPR-S-05). The samples will be submitted for geotechnical analyses (see below). A minimum of one sample per station will be submitted for geotechnical analyses. Additional sample intervals may be selected after review of the SPT blow counts and sediment lithology. The drilling and sampling will be conducted under the direct supervision of a geologist or geotechnical engineer. He/she will log the borings, record blow-counts from SPT tests, visually classify the sediments, and

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	determine samples for laboratory tests (See SOP LPR-S-05). **Anticipated Physical Methods for Geotechnical Boring Samples** The following analyses will be performed on the samples collected by sonic drilling: • Moisture Content (ASTM D 2216) • Specific Gravity (ASTM D 854) • Atterberg limits for cohesive soils (ASTM D 4318) • Grain size (ASTM D 854) The following analyses will be performed on the undisturbed samples: • Moisture Content (ASTM D 2216) • Specific Gravity (ASTM D 854) • Atterberg Limits for cohesive soils (ASTM D 4318) • Grain Size (ASTM D 854) • Unconfined compressive strength for cohesive soils (ASTM D 2166) (undisturbed samples only) **Quality Assurance/Quality Control Program (QA/QC)** QA/QC samples will be analyzed with the geotechnical boring samples as appropriate for each analytical test, such as laboratory duplicates. RM 10.9 QAPP and RM 10.9 QAPP Addendum C Worksheets #12 and #28 provide performance criteria of these precision and accuracy measurements. Field duplicates will be collected per RM 10.9 QAPP Addendum C Worksheet #20. Data verification protocols are detailed in RM 10.9 QAPP Worksheets #34, 35, 36, and 37. **Project Quantification Limits** Refer to Worksheet #15 of the RM 10.9 QAPP and RM 10.9 QAPP Addendum C. **Anticipated Data Evaluations** The results obtained from the geotechnical borings will be confirmed through a review of available site and regional geology maps, information, and reports relevant to the area.

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

STEP 6 **Specify performance or acceptance criteria**	Uncertainty is always present in the measurement and interpretation of environmental data. In this case, the focus is on collecting and interpreting data for the purpose of supporting sediment removal activities. In the absence of defined decision tolerance limits, the sampling design should still strive to identify possible sources of error and minimize them, to the extent practical. Both random and systematic errors can be introduced during the physical collection of the sample, sample handling, sample analysis, and data handling. Errors introduced through these steps will be controlled by preparing and following SOPs and establishing appropriate controls for data quality. These controls apply to field and laboratory procedures (e.g., adherence to SOPs and equipment calibration). The RM 10.9 QAPP worksheets provide further detail on error control procedures, both in the field and in the laboratory. The field SOPs included in the RM 10.9 QAPP and RM 10.9 QAPP Addendum C (Appendices B and A, respectively) and the laboratory SOPs included in the RM 10.9 QAPP and RM 10.9 QAPP Addendum C (Appendices C and B, respectively) provide supporting details. Sampling design error is the result of the inherent variability of the sampled population over space and time, the sample collection design, and the number of samples available upon which to base the decision. Because it is impossible to sample every inch of the study area, there is always a possibility that some feature of the natural variability is missed. Sampling design error can increase the chance for misrepresenting the natural variability by random error (imprecision) or systematic error (bias) in sampling. Because the number of samples controls how well the sampled population is characterized, use of the DQO process requires that the variability of data be understood to evaluate the tradeoff between uncertainty (confidence limit) and sampling intensity. This investigation is meant to characterize geotechnical engineering properties of sediment within the RM 10.9 Removal Area. This data set has a characteristic natural variability that will be represented by this data set if all other sources of variability are minimized. By reducing the errors associated with samples collection handling, analyses, and reporting with the strict adherence and use of standardized and documented procedures, as well as the noting of deviations from these procedures, the induced variability of the data set is minimized and the data set is a better representation of the RM 10.9 Removal Area.
STEP 7 **Develop the detailed plan for obtaining data**	**RM 10.9 Geotechnical Boring** The currently proposed sampling program will consist of: 1. Borings will be advanced at four stations.

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

	One sampling event will be conducted and is estimated to be one week in duration. 3. Samples will be collected from each boring (intervals to be determined in the field based on geology). 4. Samples will be submitted for the physical analyses identified in Step 5 of the DQO.

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group	Physical Testing – Atterberg limits				
Concentration Level	Low				
Sampling Procedure[a]	**Analytical Method/SOP[b]**	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assess Error for Sampling (S), Analytical (A), or Both (S&A)**
LPR-S-05	GT-4	Precision	1% Absolute	Laboratory Duplicates	A
	GT-4	Precision	RPD ≤ 50%	Field Duplicate	S & A
	GT-4	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #21
[b] Refer to QAPP Worksheet #23

Matrix	Sediment				
Analytical Group	Physical Testing - Unconfined compressive strength				
Concentration Level	Low				
Sampling Procedure [a]	**Analytical Method/SOP[b]**	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assess Error for Sampling (S), Analytical (A), or Both (S&A)**
LPR-S-05	GT-5	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #21
[b] Refer to QAPP Worksheet #23

QAPP Worksheet #14 (UFP-QAPP Manual Section 2.8.1) Summary of Project Tasks

Sampling Tasks: The sampling program includes the advancement of geotechnical borings and collection of geotechnical information to support the sediment removal activities. The four geotechnical locations are presented in Figure 1.

Geotechnical Boring Samples: Geotechnical boring samples will be collected using the sonic drill rig, the SPT split-barrel sampler for cohesionless soils and the Modified California or the thin-walled tube sampler for cohesive soils. When cohesive soils are encountered, shear strengths will be estimated in the field using a pocket penetrometer. The Relative Drilling Resistance will also be determined during sampling.

Analysis Tasks: The geotechnical boring analyses will include: Moisture content, specific gravity, Atterberg limits for cohesive soils, grain size, and unconfined compressive strength for cohesive soils.

Secondary Data: All relevant secondary/historical data are summarized on RM 10.9 QAPP Worksheet #13.

Data Management Tasks: AECOM's Data Management Plan (AECOM 2010c in RM 10.9 QAPP) covers all field-collected and laboratory-generated records/data. The handling of records and data are summarized on RM 10.9 QAPP Worksheet #29.

Documentation and Records: Project related records (field, sample transfer/chain of custody, laboratory) are summarized on RM 10.9 QAPP Worksheet #29.

Assessment/Audit Tasks: Field and laboratory audits and analysis of PE samples, specific to RM 10.9 QAPP Addendum C, will not be conducted during this field program.

Data Review Tasks: Field data will be reviewed as described in RM 10.9 QAPP Worksheet #34. Laboratories are contractually required to verify all laboratory data including EDDs as summarized in RM 10.9 QAPP Worksheet #34. Data verification and usability assessments will be conducted as detailed in RM 10.9 QAPP Worksheets #35, 36, and 37.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.2) Reference Limits and Evaluation Table

Matrix: Sediment
Analytical Group: Physical Testing, ASTM Methods D4318 (Atterberg limits for cohesive soils) and D2166 (Unconfined Compressive Strength), GeoTesting Express, Acton, MA
Concentration Level: N/A

Analyte	CAS Number	DQL	Sediment RL from 2005 QAPP	Project QL Goal	Analytical Method		Achievable Laboratory Limits	
					MDLs	Method QLs	MDLs	QLs
Atterberg Limits	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Unconfined Compressive Strength	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A

-- No CAS Number available.

N/A – Not applicable to this analysis.

QAPP Worksheet #16 (UFP-QAPP Manual Section 2.8.2) Project Schedule/Timeline Table

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Project Status	de maximis, inc. / AECOM	Monthly	Monthly	Progress report	15th of each month
Planning and Development of Study Objectives	de maximis, inc. / CH2M HILL / AECOM	April 2012	May 2012	QAPP Addendum C	May 2012
Collection of Samples and Submission for Analysis	AECOM	June 2012	June 2012	Sample submission to laboratories	At time of collection
Laboratory Analysis	AECOM	June 2012	July 2012	Analytical data to CPG	Approximately 30 days after collection. See Worksheet #30 (RM 10.9 QAPP and RM 10.9 QAPP Addendum C) for turnaround times.
Verification of Geotechnical Data	AECOM / CH2M HILL	July 2012	August 2012	Geotechnical Data to CPG/Geotechnical Data to USEPA via progress report	When completed
Preparation and Delivery of Sampling Summary Report to USEPA	de maximis, inc. / CH2M HILL / AECOM	July 2012	August 2012	Draft Sampling Report	August 2012

QAPP Worksheet #17 (UFP-QAPP Manual Section 3.1.1) Sampling Design and Rationale

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach):

The proposed geotechnical boring stations were selected for characterization of deep sediments around the perimeter of the RM 10.9 Removal Area to support design of piles for sediment resuspension control measures (e.g., silt curtain barrier system or sheet pile wall), which may be implemented during dredging activities.

These stations, presented in Figure 1, were chosen based on a review of available site and regional geology maps, and information relevant to the geotechnical study for this area.

Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations):

Geotechnical Borings

Geotechnical Boring Stations: The four proposed geotechnical boring stations are located on approximately 600 feet centers around the perimeter of the RM 10.9 Removal Area. If a boring cannot be installed to a minimum depth of 30 feet below the sediment surface or to bedrock, an alternate boring station will be selected within 75 feet of the original boring. If the second boring cannot be installed to a minimum depth of 30 feet below the sediment surface or to bedrock, an alternate boring station will be selected in consultation with USEPA.

Geotechnical Boring Sample Analysis: The geotechnical boring analyses will include: Moisture content, specific gravity, Atterberg limits for cohesive soils, grain size, and unconfined compressive strength for cohesive soils. The RM 10.9 QAPP Addendum C analytical parameters will be analyzed using the same methods and by the same laboratories, when applicable, as specified in the RM 10.9 QAPP (refer to RM 10.9 QAPP Worksheets #19, 23, and 30). Additional analytical methods are provided in this QAPP Addendum (Worksheet #23).

QAPP Worksheet #18 (UFP-QAPP Manual Section 3.1.1) Sampling Locations and Methods/SOP Requirements Table

Geotechnical Boring Station Locations					
River Mile	**Station ID**	**Water Depth[1] NGVD feet**	**Estimated Target Core Length feet**	**NAD 83 NJ State Plane Ft[2]**	
				Easting	**Northing**
10.76	12E-0371	3.55	30 - 40 ft below sediment surface or 5 ft into bedrock	592583.93	722559.54
10.87	12E-0372	7.60		592822.70	723087.25
10.99	12E-0373	5.00		593378.25	723362.07
11.11	12E-0374	10.60		593952.55	723530.05

Notes:

[1]Water depths estimated from 2007 bathymetry survey (GBA. November 2007).

[2]1983 North American Datum in State Plane Coordinate Feet.

QAPP Worksheet #19 (UFP-QAPP Manual Section 3.1.1) Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[a]	Sample Size[b]	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time[c] (preparation/ analysis)
Sediment	Atterberg Limits	N/A	GT-4	250 g	16 oz[d]	none	None established
Sediment	Unconfined Compressive Strength[e]	N/A	GT-5	Entire thin-walled core barrel	Entire thin-walled core barrel	none	None established

N/A – Not applicable to this analysis.

[a] Refer to Worksheet #23 for SOP titles.

[b] Sample size is the minimum requested by each laboratory to perform the requested analysis; minimum sample size requirements reflect the additional sample needed permit the lab to obtain a dry aliquot of sufficient size to reach project QL goals assuming samples may contain up to 50% moisture. Additional sample volume is need for field QC samples (e.g., matrix spikes).

[c] Begins at time of collection of core or grab.

[d] Included in 16 oz wide mouth glass with other parameters (see RM 10.9 QAPP Worksheet #19).

[e] All additional parameters for the undisturbed sample (moisture, specific-gravity, Atterberg Limits, and grain size) will also be taken from the thin-walled core barallel.

QAPP Worksheet #20 (UFP-QAPP Manual Section 3.1.1) Field Quality Control Sample Summary Table

Matrix	Analytical Group	Analytical and Preparation SOP Reference [a]	No. of Sampling Locations (No. of Samples)[b]	No. of Field Duplicates[c]	No. of Rinsate Blanks	No. of PE Samples[d]	Total No. of Samples to Lab
Sediment	Moisture ASTM D 2216	GT-1	4 (20)	1	N/A	N/A	21
Sediment	Grain Size ASTM D 422	GT-2	4 (20)	1	N/A	N/A	21
Sediment	Specific Gravity ASTM D 854	GT-3	4 (20)	1	N/A	N/A	21
Sediment	Atterberg limits for cohesive soils ASTM D 4318	GT-4	4 (20)	1	N/A	N/A	21
Sediment	Unconfined compressive strength for cohesive soils ASTM D 2166	GT-5	4 (4)	N/A	N/A	N/A	4

[a] Refer to Worksheet #23 for SOP title.

[b] A minimum of one sample per 10 feet will be submitted for analysis (e.g. 4 samples per 40 foot core). The sampling frequency may be adjusted if changes in the lithology indicate more frequent samples are required. Additionally, a minimum of one undisturbed sample per station will be submitted for analysis.

[c] Field duplicates will be collected at a frequency of 1 per 20 samples unless noted otherwise. The parent sample and the field duplicate will be submitted to the laboratory, analyzed, and reported as separate samples.

[d] Not Applicable for Geotechnical Samples.

QAPP Worksheet #21 (UFP-QAPP Manual Section 3.1.2) Project Sampling SOP References Table

The following is a list of the SOPs which are modified as described on this worksheet for the RM 10.9 QAPP Addendum. Refer to the RM 10.9 QAPP Worksheet #21 for other pertinent SOPs. SOPs LPR-S-01 through LPR-S-04 are replaced by SOP LPR-S-05 for the Addendum C field program.

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
LPR-G-01	Field Records	AECOM	N/A	No	RM 10.9 QAPP (Appendix B)
LPR-G-02	Navigation/Positioning	AECOM	Differential Global Positioning System (dGPS)	Yes[1]	RM 10.9 QAPP (Appendix B)
LPR-G-03	Equipment decontamination	AECOM	Various	No	RM 10.9 QAPP (Appendix B)
LPR-G-04	IDW handling and disposal	AECOM	Various	No	RM 10.9 QAPP (Appendix B)
LPR-G-05	Sample custody	AECOM	N/A	No	RM 10.9 QAPP (Appendix B)
LPR-G-06	Packaging and shipping	AECOM	N/A	Yes[2]	RM 10.9 QAPP (Appendix B)
LPR-S-05	Sediment Coring Using a Sonic Drill Rig and Collection of Geotechnical Data	AECOM	Sonic drill rig, SPT sampler, thin-walled tube sampler	No	Addendum C (Appendix A)

[1] Navigation/ Positioning will be performed with a hand held GPS.

[2] VOCs will not be collected, so Section 5.2.15 will be modified to not require sample shipping by the close of the same day the samples were collected.

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table[a]

The following is a list of the SOPs which are modified as described on this worksheet for the RM 10.9 QAPP Addendum C. Refer to the RM 10.9 QAPP Worksheet 23 for other pertinent SOPs.

Reference Number[b]	Primary Method Reference[b]	Laboratory SOP Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
GT-1[c]	ASTM D 2216	Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock Mass. Rev 6, 7/ 2011	Definitve	Physical Testing	Analytical Balance	GeoTesting Express, Acton, MA	No
GT-3[c]	ASTM D 854	Standard Test Method for Specific Gravity of Soil Solids by Water Pycnometer, Rev. 6, 7/2011	Definitive	Physical Testing	Pycnometer	GeoTesting Express, Acton, MA	No
GT-4	Atterberg limits for cohesive soils	Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils, ASTM D 4318 – latest revision. Rev. 5, 7/2011	Definitive	Physical Testing	Liquid Limit Device	GeoTesting Express, Acton, MA	No
GT-5	Unconfined compressive strength for cohesive soils	Standard Test Method for Unconfined Compressive Strength of Cohesive Soils, ASTM D 2166 – latest revision. Rev. 4, 9/2010	Definitive	Physical Testing	Geocomp LoadTrac or LoadTrac II (including load cell and LVDT	GeoTesting Express, Acton, MA	No

[a] SOP GT-2 is contained in Appendix C-1 of the RM 10.9 QAPP; the remaining SOPs are included in Appendix B of RM 10.9 QAPP Addendum C .

[b] It is expected that the procedures outlined in these SOPs will be followed. Procedural modifications to individual SOPs may be warranted depending upon an individual sample matrix, interferences encountered, or limitations imposed by the procedure. Deviations from individual SOPs will be documented in the laboratory records. Substantive modification to any SOP will be approved in advance by the AECOM Project QA Manager and AECOM Task Manager and communicated to the CPG Coordinator and to the USEPA Remedial Project Manager. The ultimate procedure employed will be documented in the report summarizing the results of the sampling event or field activity.

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table[a]

[c] Updated versions of the SOPs included in the RM 10.9 QAPP.

QAPP Worksheet #24 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[a]
Analytical Balance (Grain Size, Percent Moisture, Specific Gravity, Atterberg Limits)	Weigh and record NIST traceable standard weight in range of interest	Daily	± 5% of certified weight	Inspect system, correct problem, rerun calibration and affected samples	Analyst	GT-1, GT-2, GT-3, GT-4
Liquid Limit Device and Grooving Tool	Check dimensions of liquid limit device and grooving tool using caliper capable of reading to the nearest 0.01mm; check for excessive wear	Daily	Cup Radius ± 2mm Cup Thickness ± 0.1 mm Cup Depth ± 1 mm Wear on cup at point of contact on base ±13 mm	Replace device	Analyst	GT-4
Load Trac –II (Soil Shear Stress Testing)	Confirm that rate of motor movement is as required for test	Daily	Load value readout matches requested value	Inspect system, correct problem, rerun calibration check samples and any affected samples	Analyst	GT-5

[a] Refer to the Analytical SOP References table (Worksheet #23). SOP GT-2 is contained in Appendix C of the RM 10.9 QAPP; the remaining SOPs are included in Appendix B of RM 10.9 QAPP Addendum C.

QAPP Worksheet #25 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[a]
Analytical Balance (Grain Size, Percent Moisture, Specific Gravity, Atterberg Limits)	Clean balance after each use; service annually	NIST Traceable weights	Instrument performance	Prior to every use	Measured weight within certified tolerance	Clean, verify zero on balance, reweigh; call for service	Analyst or Section Supervisor	GT-1, GT-2, GT-3, GT-4G
Liquid Limit Device and Grooving Tool	Clean after each use	Caliper capable of reading to nearest 0.01 mm	Check critical dimensions and check for signs of wear	Daily	Measurements within tolerances	Replace device	Analyst or Section Supervisor	GT-4
Load Trac-II (Soil Shear Testing Equipment)	Dry and clean all pieces of test equipment	Use independently calibrated load ring or proving ring	Check alignment of the load cell button and the top cap on the soil sample	Prior to every use	Review calibration data, correlation coefficient must be ≥0.999	Repeat calibration process	Analyst or Laboratory Manager	GT-5

[a] Refer to the Analytical SOP References table (Worksheet #23). All SOPs are contained in Appendix C.

QAPP Worksheet #27 (UFP-QAPP Manual Section 3.3.3) Sample Custody Requirements

Sample Identification

Samples will be uniquely identified at the time of collection. The sample ID will include the following alpha (A) or numeric (N) characters:

- NNA – Event (the year and the event within that year). "12E" identifies the RM 10.9 Addendum C – Data Gap Sample Collection to Support Sediment Removal Activities sampling event.
- NNNN – Location (location number preceded by a "0").
- A – Sample: C (core).
- NN – Sequential number representing core attempt number. Note that each core is assigned a unique number upon retrieval, regardless of its acceptability.
- A – Depth. This character represents the relative depth interval, with "A" being most surficial, and "B", "C", "D", etc. being assigned with increasing depth.
- A – Sample type: S (field sample), T (field duplicate).

For example,

12E-0371-C01 is the first core collected from Station 371.

12E-0372-C01AS is the first sample interval from Station 372.

Sample Packaging and Shipping Requirements

Sample custody must be maintained through shipment of samples to the contracted laboratory. Samples for physical analysis will be delivered directly to the laboratory by sampling personnel or will be shipped using the procedures outlined in SOP LPR-G-6 (Appendix B of the RM 10.9 QAPP).

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Physical Testing – Atterberg Limits
Concentration Level	Low
Sampling SOP	LPR-S-05
Analytical Method/ SOP Reference	GT-4
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	GeoTesting Express, Inc., Acton, MA
Number of Sample Locations	4

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Duplicates	1 Per batch of 20 samples	1% Absolute	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	1% Absolute
Field Duplicate	1/20 field samples	RPD ≤ 50%	Evaluate during data verification. Qualify data.	CH2M Hill Geotechnical Team	Precision	RPD ≤ 50%

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Physical Testing – Unconfined Compressive Strength
Concentration Level	Low
Sampling SOP	LPR-S-05
Analytical Method/ SOP Reference	GT-5
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	GeoTesting Express, Inc., Acton, MA
Number of Sample Locations	4

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
NA	NA	NA	NA	NA	NA	NA

QAPP Worksheet #30 (UFP-QAPP Manual Section 3.5.2.3) Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Locations/ ID Number	Analytical SOP	Data Package Turnaround Time[a]	Laboratory/ Organization	Backup Laboratory/ Organization
Sediment	Atterberg Limits	N/A	All	GT-4	30 days	GeoTesting Express, Inc. 125 Nagog Park Acton, MA 01720 Gary Torosian 978.893.1229	PTS Laboratories 8100 Secura Way Santa Fe Springs, CA 90670 Michael Mark Brady 562.347.2502
Sediment	Unconfined Compressive Strength	N/A	All	GT-5	30 days	GeoTesting Express, Inc. 125 Nagog Park Acton, MA 01720 Gary Torosian 978.893.1229	PTS Laboratories 8100 Secura Way Santa Fe Springs, CA Michael Mark Brady 562.347.2502

[a] Turnaround time is in calendar days from receipt of the last sample in the data package sample delivery group.

QAPP Worksheet #37 (UFP-QAPP Manual Section 5.2.3) Usability Assessment

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:
CH2M HILL's geotechnical team will compare results to the ASTM methods. The CH2M Hill Feasibility Study Manager, in conjunction with the geotechnical team, will determine whether the physical data meet the requirements for use in making decisions related to further actions at the site. The results of laboratory measurements will be compared to the DQOs described in Worksheet #11 of this document.

Describe the evaluative procedures used to assess overall measurement error associated with the project:
During the data evaluation process the reviewer will use information confirming sample identification; sample preparation; instrument calibration data; and results of QC samples designed to identify any limitations in data use and, if known, data bias. Data that do not meet the quality acceptance limits of Worksheet #28 or analytical performance criteria specified in Worksheet #12 will be clearly identified in the database so data users are aware of any limitations associated with data usability. Details of the problems identified during data evaluation and the bias in the data will be provided in the associated verification memorandum.

Identify the personnel responsible for performing the usability assessment:
Data evaluation will be performed by CH2M HILL's geotechnical engineering staff under the supervision of the CH2M Hill Feasibility Study Manager. The usability assessment will be performed jointly by the CH2M HILL and CPG project teams and will include input by field personnel, QA staff, and project management.

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:
The documentation generated during data evaluation will include a memorandum that describes the information reviewed, the results of this review and a recommendation on overall data usability and limitations on specific data points. The memorandum will provide information on the samples included in the review and the date they were collected; the condition of samples when received at the laboratory and any discrepancies noted during the receiving process; verification of sample preparation; instrument calibration information; review of associated field and/or laboratory duplicates.

Appendix A

Field Standard Operating Procedures

Appendix B

Laboratory Standard Operating Procedures